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Attorney Docket: 313KA/49958
PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant:	MAMORU AOKI ET AL.		
Serial No.:	09/851,347	Group Art Unit:	2834
Filed:	MAY 9, 2001	Examiner:	HEBA ELKASSABGI
Title:	MOTOR		

APPEAL BRIEF UNDER 37 C.F.R. §1.192

Commissioner for Patents
Washington, D.C. 20231

Sir:

This appeal brief is submitted in triplicate and is accompanied by a check in the amount of $320.00 in payment of the appeal brief fee. If the check becomes detached, or if there is any deficiency, please charge any required fee to the Deposit Account 05-1323 (Docket No. 313KA/49958).

This is an appeal of the September 10, 2002 final rejection of Claims 1 and 2 in the above-captioned application.

Real Party in Interest

This application is assigned to NSK Ltd. of Tokyo Japan, which is the real party in interest in this appeal.

Related Appeals and Interferences

Applicants and their counsel are not aware of any related appeals or interferences which would affect, be affected by, or have a bearing on the instant appeal.

Status of Claims

Claims 1 and 2 are pending. Claims 1 and 2 are finally rejected and form the subject of this appeal.

Status of Amendments

There are no unentered amendments.

Summary of Invention

The claimed invention is directed to a motor for use in office automation devices. In the embodiment shown in Figures 1-3, the motor includes a rotor (1), a stator (2), a shaft (3), and a rolling bearing (4). One of the stator (2) and rotor (1) is provided with a housing (11). The rolling bearing (4), disposed between the housing (11) and the shaft (3), has an inner race (42) and an outer race (43). The inner race (42) is fixed to the shaft (3) by way of press-fit or adhesive applied between the outer peripheral surface of the shaft (3) and the inner peripheral surface of the inner race (42). The outer race (43) is fixed to the housing (11) by way of press-fit or adhesive applied between the outer peripheral surface of the outer race (43) and the inner peripheral surface of the housing (11). In the rolling bearing shown in Figures 1-3, at least one of the outer peripheral surface of the shaft (3) and the inner peripheral surface of the housing (11) has knurled grooves (31). According to the claimed invention, the number (P) of knurled grooves (31) and the number (Z) of rolling members (41) of the rolling bearing (4) may be defined by the formulae $P \neq nZ$ and $P \neq nZ \pm 1$, wherein n can be any positive integer. Alternatively, the number (P) of knurled grooves (31) and the number (Z) of rolling members (41) of the rolling bearing (4) may be defined by the formula $P = nZ \pm X$, where n can be any positive integer, and X is 2 or an integer greater than 2.

In a prior art motor for office automation devices, the knurled grooves, as well as the curing of adhesive, may cause deformation (unevenness and/or waves) on the race surfaces of the rolling bearing. This deformation may cause vibration and non-repetitive runout when the rolling members of the bearing roll over the deformed bearing race surfaces.

Applicants discovered that this problem can be solved by defining the relationship between the number (P) of knurled grooves and the number (Z) of rolling members in accordance with the formula $P = nZ \pm X$ or in accordance with the formulae $P \neq nZ$ and $P \neq nZ \pm 1$.

Rejection

Claims 1 and 2 stand rejected under 35 U.S.C. §103(a) as being unpatentable over Obara (U.S. Patent 5,841,210) in view of Yoshimura et al. (U.S. Patent 5,510,661).

Issue

The issue on appeal is whether the Examiner is incorrect in stating that the discovery of the formulae of Claims 1 and 2, which define the structural relationship between the number of knurled grooves and the number of rolling members of the rolling bearing, involved only ordinary skill in the art.

Grouping of Claims

For the purpose of this appeal, Claims 1 and 2 stand or fall together.

Argument

I. Background

In the Office Action dated May 3, 2002, the Examiner rejected pending Claims 1 and 2 under 35 U.S.C. §103(a) as being unpatentable over Obara (U.S. Patent 5,841,210) in view of Yoshimura et al. (U.S. Patent 5,510,661).

According to the Examiner, Obara discloses all but two features of the claimed invention. One of the undisclosed features is that at least one of the outer peripheral surface of the shaft and the inner peripheral surface of the housing is formed with knurled grooves. The Examiner stated that Yoshimura et al. discloses a shaft with an outer knurled portion and that it would have been obvious to modify Obara's invention to add the outer knurled portion.

The other undisclosed feature is the relationship between the number of knurled grooves and the number of rolling members of the rolling bearing as defined by the formulae recited in Claims 1 and 2. The Examiner concluded that it would have been obvious to propose the ideal number of grooves on the shaft. To support her conclusion, the Examiner cited *In re Aller* 105 USPQ 233 (CCPA, 1955) as supporting the proposition that wherein the general conditions of a claim are

disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art.

In the response filed on May 3, 2002, Applicants argued that the Examiner's analysis with respect to the obviousness of the claimed relationship between the number of knurled grooves and the number of rolling members of the rolling bearing is erroneous both in law and in fact. With regard to the law, Applicants stated that the Examiner's reading of *In re Aller* is incorrect. Applicants pointed out that nowhere in *In re Aller* can the language that "discovering the optimum or workable ranges involves only routine skill in the art" be found. *In re Aller* actually recites that "wherein the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation (emphasis added)." Therefore, Applicants pointed out that according to *In re Aller* two of the requirements for a finding of obviousness are (1) discovery of optimum or workable ranges and (2) the discovery is made through routine experimentation. The Examiner's analysis, Applicants argued, completely ignored the second requirement.

Applicants stated that the Examiner's analysis is also factually erroneous because, contrary to the Examiner's assertion, the claimed invention does not involve a discovery of an optimum or workable range. Applicants stated that the claimed relationship between the number of knurled grooves and the number of rolling members do not define a range. In fact, Applicants pointed out that the claimed invention teaches neither a lower limit nor an upper limit on the number of knurled grooves or on the number of rolling members, and the number of knurled grooves or the number of rolling members can be any number.

Applicants also pointed out that the rejection is improper because the discovery of the claimed relationship did not involve routine experimentation, as required by *In re Aller*.

In the final Office Action, the Examiner cited three pieces of evidence that she claimed support her reading of *In re Aller* (the final Office Action, last two paragraphs of page 3 and the first paragraph of page 4). First, the Examiner cited a USPQ headnote for *In re Aller* as stating that "where general conditions of claim are

disclosed in prior art, it is not inventive to discover optimum or workable ranges by routine experimentation (emphasis added)."[1]

Second, the Examiner cited *In re Swain et al.* 156 F.2d 239, 70 USPQ 412 (CCPA, 1946) as holding that "[n]o invention is involved in discovering optimum ranges of a process by routine experimentation (emphasis added)."[2]

Third, the Examiner cited MPEP 2144.05 II as stating "[t]he court held that a person of ordinary skill in the art would logically assume that a higher yield could be obtained by experimentally varying conditions to achieve the most productive conditions."[3]

Although the evidence cited by the Examiner actually supports Applicants' reading of *In re Aller*, the Examiner inexplicably maintained that the obviousness test of *In re Aller* does not require the element of "routine experimentation" (final Office Action, page 4, second paragraph).

With regard to Applicants' argument that the claimed invention does not involve a discovery of an optimum or workable range, the Examiner argued that the claimed invention involves the determination of a workable range, because the claims specifically define a working ratio (final Office Action, page 5, first full paragraph).

II. The Examiner is incorrect in stating that the discovery of the formulae of Claims 1 and 2 involved only ordinary skill in the art.

According to the Examiner, Claims 1 and 2 are obvious because the formulae of Claims 1 and 2 merely determine a workable range of a known condition (final Office Action, page 4, second paragraph). To support her position, the Examiner relies on *In re Aller*, which, she claims, holds that for an inventor to discover the

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[1] This headnote requires the element of "routine experimentation." Therefore, it actually supports Applicants' reading of *In re Aller*, not the Examiner's, aside from the problem that the headnote is not a part of the opinion.

[2] The alleged holding of *In re Swain et al.* also supports Applicants' reading of *In re Aller*.

[3] Applicants' counsel has carefully reviewed MPEP 2144.05 II but could not find this statement.

optimum or workable range of a known condition requires only ordinary skill in the art (final Office Action, page 4, second paragraph).

Applicants submit that the Examiner is wrong both in law and in fact. With regard to the law, Applicants submit that the Examiner's reading of *In re Aller* is incorrect. The Examiner has failed to provide any support for her reading of *In re Aller*. Some of the evidence cited by the Examiner to support her reading of *In re Aller* (final Office Action, page 3, last two paragraphs) actually supports Applicants' reading, because it shows that the obviousness test of *In re Aller* requires the element of "routine experimentation." The rest of the purported evidence (final Office Action, page 4, first paragraph) cannot be found at the source cited by the Examiner.

Applicants submit that, as stated in the last two paragraphs on page 3 of the final Office Action, *In re Aller* stands for the proposition that "wherein the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation (emphasis added)." Therefore, according to *In re Aller*, two of the requirements for a finding of obviousness are (1) discovery of optimum or workable ranges and (2) the discovery is made by routine experimentation.

In her analysis of obviousness, the Examiner completely ignored the second requirement. The Examiner failed to show, as required by *In re Aller*, that the alleged discovery of optimum or work ranges involves only routine experimentation. In fact, the claimed invention does not involve only routine experimentation; it involves a keen insight that the deformation of bearing race surfaces can be reduced or prevented by the claimed relationship between the number of knurled grooves and the number of rolling members.

Therefore, the rejection of claims 1 and 2 is improper because it is based on erroneous legal reasoning. Reversal of the rejection is respectfully requested.

Applicants submit that the Examiner's obviousness rejection is erroneous also in fact, because the Examiner incorrectly states that the claimed invention involves the discovery of optimum or workable ranges.

In re Aller deals with the issue of claimed optimum ranges. The claim at issue in *In re Aller* specifies two ranges: a concentration of aqueous sulfuric acid between 25 and 70% at temperatures between 40 and 80 degrees.

In re Aller is not applicable in the present case, because Claims 1 and 2 do not specify any ranges. According to the claimed invention, the number of knurled grooves or the number of rolling members can be any number, as long as the relationship between the two satisfies the formulae of Claim 1 or 2. In other words, the number of knurled grooves or the number of rolling members has no lower or upper limit. Without a lower or upper limit, there cannot be a range.

In the response submitted on August 3, 2002, Applicants requested that the Examiner indicate what she considered to be the optimum or workable ranges of the claimed invention and the lower and upper limits thereof so that Applicants could provide a suitable response. The Examiner failed to respond to Applicants' request. She merely asserted that the claimed invention involves the determination of a workable range, because the claims specifically define a working ratio (final Office Action, page 5, first full paragraph).

Applicants submit that it is incorrect to state that the claims involve the determination of a workable range, because they define a working ratio. The terms "range" and "ratio" are very different mathematical concepts. The term "range" can be defined as a set of values within given limits, while the term "ratio" can be defined as the relation between two quantities expressed as the quotient of one divided by the other. A range generally has a minimum limit or a maximum limit, while a ratio has no minimum or maximum limit. A range involves only one variable, while a ratio involves two variables. Although there are many other differences, Applicants will not belabor the point, since it is very clear that a "ratio" is not a "range."

Applicants further submit that it is incorrect to state that Claims 1 and 2 recite a ratio. A ratio is defined by the formula P/Z = constant. In Claim 1, each of the two formulae uses an unequal sign and therefore does not define a ratio. In Claim 2, the formula also does not define a ratio, because of the presence of the integer "X," which is 2 or greater, and also because "n" is any positive integer and

therefore is not a constant. The formula of Claim 2 defines a ratio only when "X" is equal to zero and "n" is a constant.

Applicants submit that since the claimed invention does not involve the discovery of optimum or workable ranges, it is patentable over the cited references even under the Examiner's reading of *In re Aller*. In other words, even if discovering the optimum or workable ranges involved only routine skill in the art, the claimed invention would still be patentable because it does not claim optimum or workable ranges.

Therefore, the rejection of Claims 1 and 2 is improper because they do not claim optimum or workable ranges. Reversal of the rejection is respectfully requested.

III. Claims 1 and 2 are patentable over the cited references

Although Applicants believe that the above discussion establishes that the Examiner's rejection of Claims 1 and 2 is improper, Applicants wish to point out that Claims 1 and 2 are patentable over the cited references.

The formulae of Claims 1 and 2 define the structural relationship between two bearing components, namely the knurled grooves and the rolling members. Applicants discovered that when this relationship is satisfied, the deformation of bearing races is reduced or prevented, resulting in reduced bearing vibration and wear, and longer service life.

This feature of the claimed invention is not disclosed or suggested by the cited references. The cited references do not suggest in any way that the deformation of bearing races can be reduced or prevented by defining the relationship between the number of knurled grooves and the number of rolling members, or even that the deformation of bearing races is affected by the relationship.

One of the cited references, Obara, is concerned with the difficulty and costs of assembling a compound bearing assembly (column 1, lines 11-50). The solution provided by Obara is to provide a pre-assembled compound bearing assembly (column 1, lines 53-59).

The other cited reference, Yoshimura et al., is concerned with the problem of securely fixing a bearing to the spindle of a motor (column 1, lines 9-52). The solution provided by Yoshimura et al. is to provide the spindle with a knurled portion (column 1, line 56 to column 2, line 12). The solution of Yoshimura et al. is described as prior art in the Background section of the present application (the paragraph bridging pages 2 and 3).

Accordingly, one with ordinary skill in the art reading the cited references would not recognize that the deformation of bearing races can be reduced or prevented by defining the relationship between the number of knurled grooves and the number of rolling members in accordance with the formulae of Claim 1 or 2.

Additionally, as Applicants have previously stated in the response filed March 1, 2002, not only that the cited references do not teach the claimed invention, Yoshimura et al. actually teaches away from the claimed invention. Yoshimura et al. teaches that the deformation of a bearing inner race, caused by the curing of adhesive, is prevented by keeping the outer diameter of the knurled portion of the motor's spindle within the tolerance of the inner race (column 4, lines 34-41). Therefore, Yoshimura et al. leads its readers away from the solution provided by the claimed invention. Because the cited references teach away from the claimed invention, the claimed invention is not rendered obvious by the cited references. *In re Geisler*, 116 F.3d 1465, 1471, 43 USPQ2d 1362, 1366 (Fed. Cir. 1997) (a *prima facie* case of obviousness may be rebutted by showing that the art, in any material respect, teaches away from the claimed invention).

The non-obviousness of the claimed invention is further supported by the fact that the claimed invention achieves unexpected results. *In re Corkill*, 711 F.2d 1496, 226 USPQ 1005 (Fed. Cir. 1985) (a greater than expected result is an evidentiary factor pertinent to the legal conclusion of obviousness of the claims at issue). The claimed invention demonstrates that the deformation of bearing races can be reduced or prevented, without increasing the thickness of the bearing races, by defining the relationship between the number of knurled grooves and the number of rolling members in accordance with the formulae of Claim 1 or 2. The prior art, however, does not even recognize there is any relationship between the deformation of bearing

races and the number of knurled grooves or the number of rolling members. Therefore, the result of the claimed invention is completely unexpected.

Conclusion

For the foregoing reasons, the rejection of Claims 1 and 2 under 35 U.S.C. §103(a) is in error, and the Board is respectfully requested to reverse the rejection.

Respectfully submitted,

February 10, 2003

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APPENDIX

The claims on appeal as currently amended read as follows:

1. (Amended) A motor comprising a rotor, a stator, a shaft, and a rolling bearing, one of the stator and the rotor being provided with a housing, the rolling bearing being provided between the housing and the shaft and having an inner race and outer race, the shaft having an outer peripheral surface, the housing having an inner peripheral surface, the inner race having an inner peripheral surface and the outer race having an outer peripheral surface, the inner race being fixed to the shaft through one of press-fitting and use of an adhesive between the outer peripheral surface of the shaft and the inner peripheral surface of the inner race, the outer race being fixed to the housing through one of press-fitting and use of an adhesive between the outer peripheral surface of the outer race and the inner peripheral surface of the housing, and at least one of the outer peripheral surface of the shaft and the inner peripheral surface of the housing being formed with knurled grooves, wherein the number (P) of the knurled grooves in the circumferential direction and the number (Z) of the rolling members in the rolling bearing are in the relations of $P \neq nZ$ and $P \neq nZ \pm 1$ where n is a positive integer.

2. (Amended) A motor comprising a rotor, a stator, a shaft, and a rolling bearing, one of the stator and the rotor being provided with a housing, the rolling bearing being provided between the housing and the shaft and having an inner race and outer race, the shaft having an outer peripheral surface, the housing having an inner peripheral surface, the inner race having an inner peripheral surface and the outer race having an outer peripheral surface, the inner race being fixed to the shaft through one of press-fitting and use of an adhesive between the outer peripheral surface of the shaft and the inner peripheral surface of the inner race, the outer race being fixed to the housing through one of press-fitting and use of an adhesive between the outer peripheral surface of the outer race and the inner peripheral surface of the housing, and at least one of the outer peripheral surface of the shaft and the inner peripheral surface of the housing being formed with knurled grooves, wherein the number (P) of the knurled grooves in the circumferential direction and the number (Z) of the rolling members in the rolling bearing are in the relation of $P = nZ \pm X$, where n is a positive integer, and X is 2 or an integer larger than 2.